

Identifying Communication Gaps in Ohio's Beef Supply Chain

Honors Research Thesis

by

Sandra Molly DePue

The Ohio State University

Project Advisors: Henry Zerby and Francis Fluharty, Department of Animal Sciences

Abstract

Ohio has a unique infrastructure: a large urban-rural interface, active beef industry, and several small meat processing facilities, which provide opportunities for food animal producers to engage in value-added marketing strategies. Information regarding where discrepancies lie between the various links of the beef production chain and market drivers of locally produced beef will help producers and processors make more informed decisions on production and marketing strategies and thus, enhance their economic sustainability and success. Producers, especially, could benefit from increased revenues, which may help Ohio retain its number of small family farms. A series of surveys conducted in association with previous market research projects and feasibility studies in Ohio were used to compare responses regarding market drivers and perceived priorities of beef characteristics that were important to consumers by each of the various segments of the supply chain (consumer – processor – producer). Similar questions were identified among the surveys and were evaluated to recognize trends among responses. In regard to the attributes consumers find most important in beef purchases, processor awareness was hypothesized to be greater than producer awareness due to closer proximity to the consumer in the production chain. Results indicate that consumers rank freshness as the greatest priority in making purchasing decisions of locally produced beef while processors and producers ranked taste as the greatest priority. Across all three groups, tenderness and price ranked second and third, respectively. This study indicates that Ohio producers and processors have a different perception of important features for locally produced beef than consumers. Thus, there is opportunity to realign and improve awareness of Ohio consumers' primary focus areas concerning beef products, as well as the potential to adjust marketing strategies to improve sales for locally produced beef in Ohio.

Introduction

Research conducted within the U.S. beef industry has shown that product quality is directly linked to consumer perception and preference, and therefore is constantly changing (Resurreccion, 2003; Bernués *et al.*, 2003). Perception, being the underlying factor for preference, is influenced by the combination of intrinsic cues such as meat color, fat color, and marbling content; it is also influenced by extrinsic cues such as packaging or labeling (Umberger *et al.*, 2009). Consumer preferences have been shown to change over the years due to increased focus on convenience, healthiness, food safety, price, and animal welfare (Resurreccion, 2003). While such research is yielding industry and commodity groups a more complete understanding of how consumers make decisions in their beef purchasing, there is a seeming lack of focus on educating the other links in the supply chain of this information. It begs to question if all members of the beef supply chain are equally aware of what the consumer wants.

Ottesen (2006) suggests that those farther from the end-products in a food production chain focus only on what the immediate next link requires, and therefore they do not accurately predict consumer desires due to lack of direct involvement with them. Sepúlveda *et al.* (2011) concurs with this theory and reported that because consumers and producers are on opposing ends of the meat production chain, one is generally unaware of how the other perceives and evaluates quality. Despite these findings, there has been limited research to isolate where between the two ends of the US beef industry the largest gaps in awareness have formed, much less in agricultural states such as Ohio.

Ohio, however, is in a unique situation compared to most other states. Currently, Ohio is ranked within the top ten states for population density (U.S. Census Bureau, 2012), and therefore has an extensive urban-rural interface. At the same time, in the past ten years, Ohio has been one of

only eleven states not to experience an increase in farm numbers (USDA/NASS, 2009), and one of only six states to experience a 2.0% or greater decrease (Figure 1). In fact, Ohio has experienced a substantial decline in number of farms, from over 120,000 in 1964 to barely 75,000 in 2007, many of these small in addition to being family owned and operated (USDA/NASS, 2009). Despite this, Ohio is ranked within the top five states for highest number of livestock slaughter plants (USDA/NASS, 2011; Figure 2). The vast majority of these are smaller processing facilities that conduct business on a local level, creating opportunities for niche marketing and/or direct value-added marketing between producers in the rural landscape and consumers in the more urban sector.

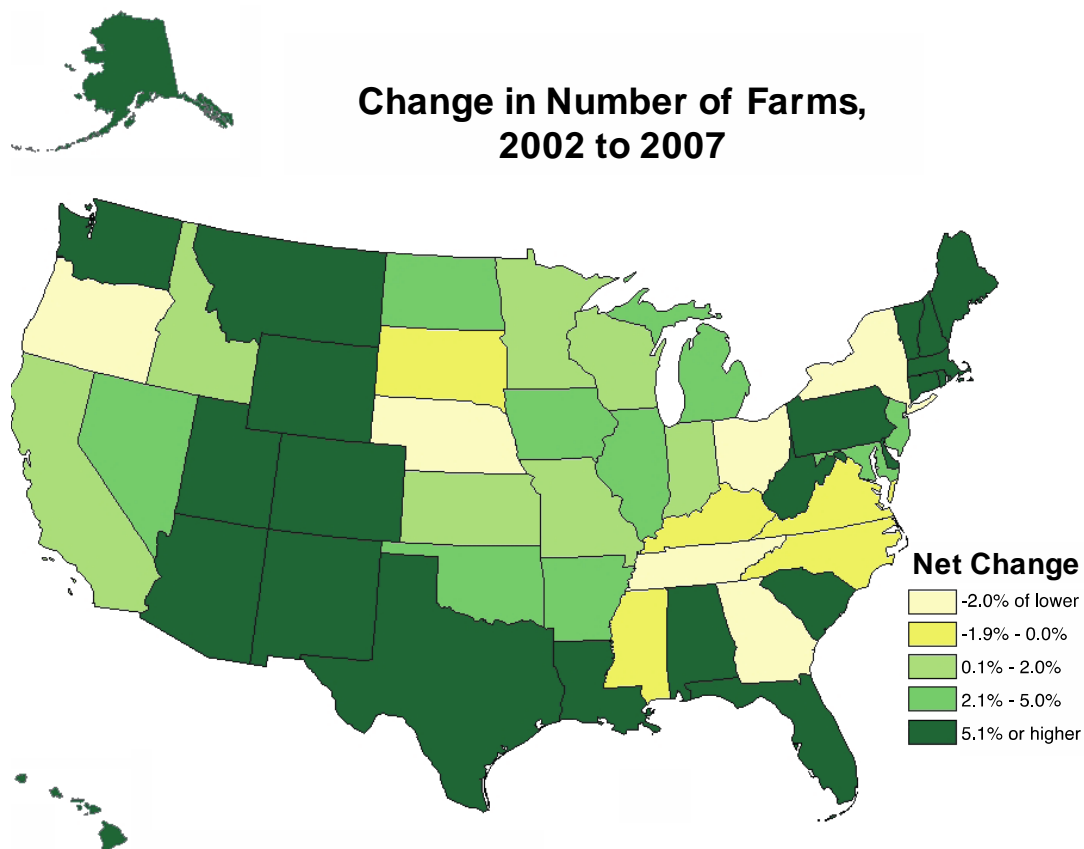


Figure 1. Change in percentage of farms in each state from 2002 to 2007 (USDA/NASS, 2007)

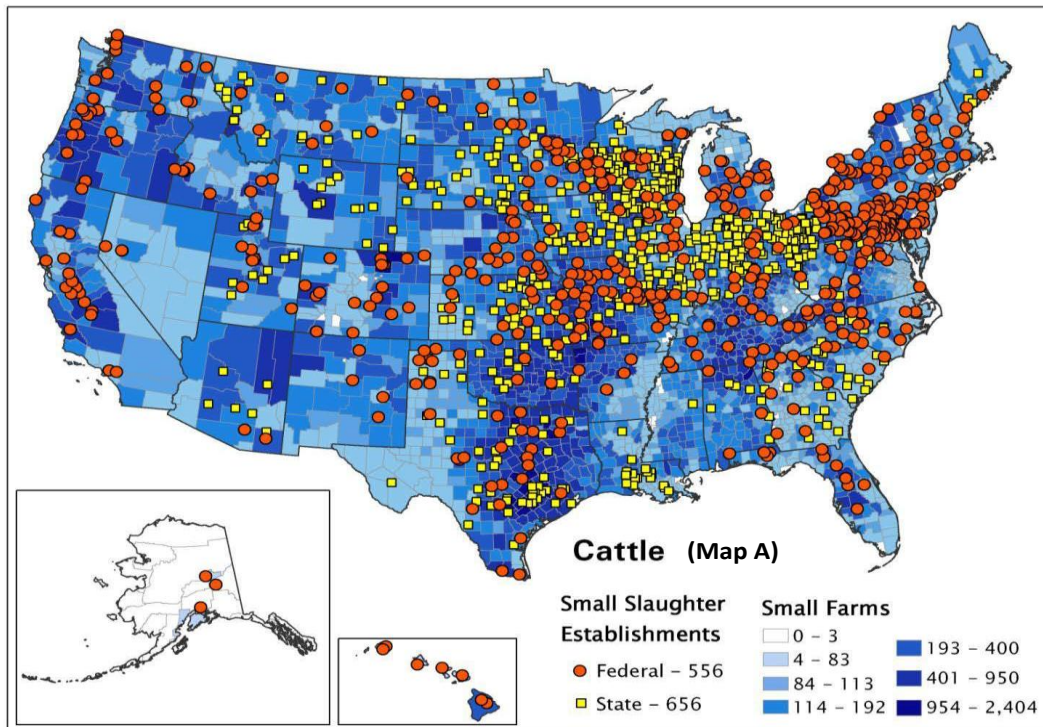


Figure 2. Map depicting the density, per county, of small producers of cattle operations and the locations of Federally- and State-inspected slaughter establishments. The establishments shown are all either “small” or “very small” as defined in the 1996 HACCP regulations. “Small” slaughter establishments have between 10 and 499 employees. “Very small” slaughter establishments have fewer than 10 employees or less than \$2.5 million in annual sales. (USDA/FSIS, 2010)

To assist Ohio’s beef producers who are interested in capitalizing on Ohio’s unique infrastructure which can facilitate niche and direct marketing programs, it is necessary to determine if the areas of miscommunication are specifically localized between two adjacent components of the supply chain or if it is more widely spread across the supply chain. Information regarding where discrepancies lie between the various links of the beef production chain will help producers and processors make more informed decisions on production and marketing strategies and thus, enhance their economic sustainability and success.

Procedures and Methods

A series of surveys that were conducted in association with previous market research projects and feasibility studies in Ohio were used to gather responses regarding market drivers and desires from the various segments of the supply chain (consumer – processor – producer). Consumer data was utilized from the 2001 Ohio Department of Agriculture Ohio Born and Raised Beef Survey, conducted by the University of Dayton Business Research Group. Processor data was utilized from the 2012 Ohio State University Processor Survey Assessing Production, Economics, and Marketing of Meat from Forage-Based Systems. Producer data was utilized from the 2011 Ohio State University Producer Survey Assessing Production, Economics, and Marketing for Forage-Based Systems.

Similar free response questions among the surveys were analyzed and compared to find trends or lack thereof among responses (Appendix I). Specifically, questions ranking beef product quality factors (i.e. flavor, tenderness, or price) and their relevance to the consumer were identified. Number of responses to these questions were categorized and then converted to a percentage scale of the total number of responses to compare the relative importance of product attributes as they were perceived by supply chain partners in comparison with consumer responses.

Results

Responses in each of the survey questions fell into six general categories: freshness, tenderness, taste (including flavor and juiciness), packaging, price, and appearance or color. Table 1 below shows the relative percentage of total responses within supply chain segments for each beef attribute, as well as the relative ranking of attributes based on these percentages. Furthermore,

Figure 3 demonstrates the similarities and differences in relative percentages of total responses between beef consumers, processors, and producers.

Table 1. Number of responses and percentage of total responses to the question of “What are the beef product attributes of greatest priority to consumer purchasing decisions?” (Appendix I).

Attributes	Consumer			Processor			Producer		
	Number of responses	Percentage of total responses	Rank	Number of responses	Percentage of total responses	Rank	Number of responses	Percentage of total responses	Rank
Freshness	130	42.6	1	22	8.1	4	9	1.6	5
Tenderness	76	24.9	2	86	31.6	2	174	31.8	2
Price	59	19.3	3	46	16.9	3	98	17.9	3
Appearance/Color	29	9.5	4	6	2.2	6	9	1.6	5
Taste	8	2.6	5	94	34.6	1	248	45.3	1
Packaging	3	1.0	6	18	6.6	5	10	1.8	4
Totals	305	100.0		272	100.0		548	100.0	

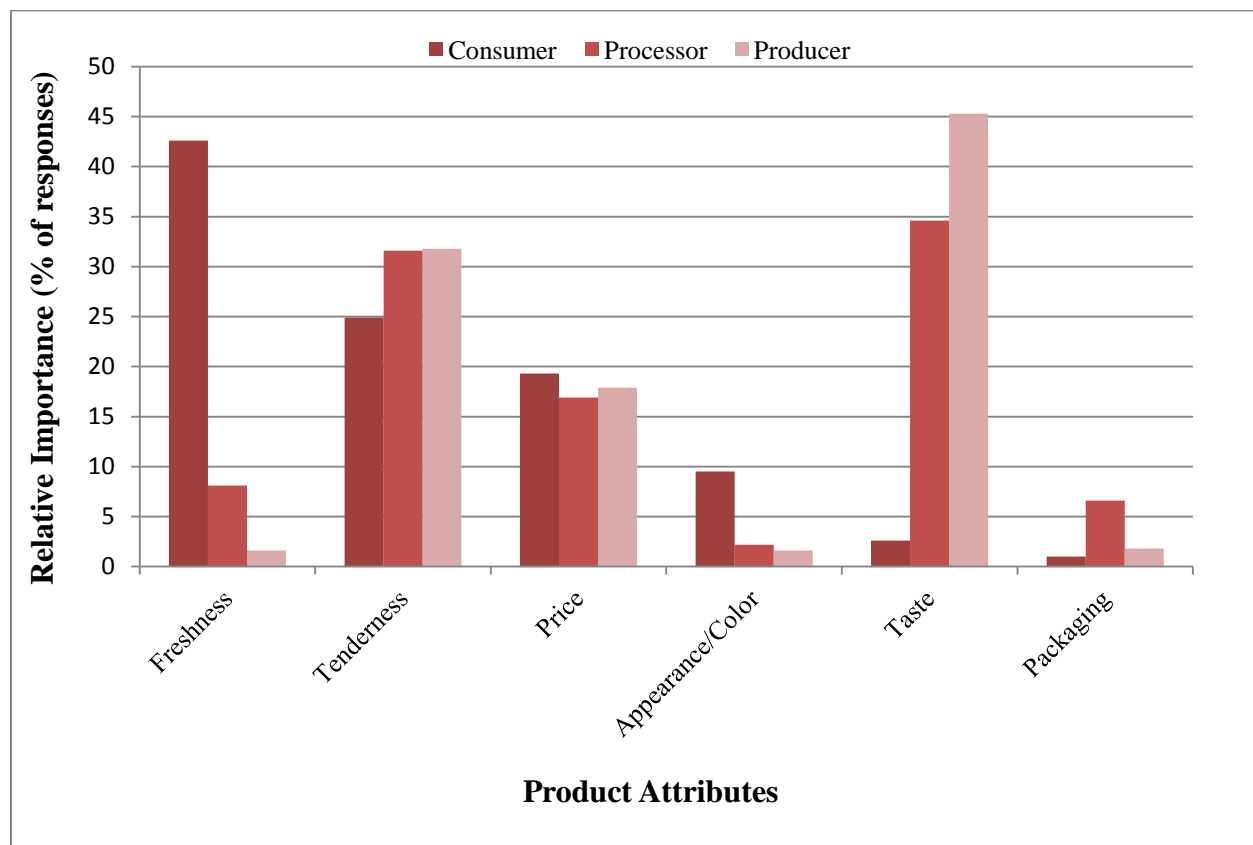


Figure 3. Comparison of relative importance of beef product attributes among Ohio beef supply chain partners. Responses are presented as a percentage of the responses within each supply chain partner for each attribute.

In general, producers and processors were similar in their rankings of product attributes, especially among their top three ranked responses. In contrast, the consumers' rankings differed from that of producers and processors in that freshness received a greater priority than taste. Overall, the order and magnitude of the rankings between supply chain groups were similar across tenderness, price, appearance/color, and packaging.

Freshness

One of the most significant differences that occurred between the responses of consumers and the other two studied components of the supply chain regarded the relative ranked importance of freshness. Amongst beef consumers, freshness ranked first with an overwhelming 42.6% of responses, while it ranked fourth at 8.1% and tied for fifth at 1.6% with beef processors and producers, respectively.

Tenderness

Across all three Ohio beef supply chain segments, tenderness consistently ranked second. It was chosen by consumers slightly less often than by processors and producers, composing only 24.9% of total consumer responses as opposed to 31.6% and 31.8% among processors and producers, respectively. This difference, however, is not very severe compared to other beef product attribute categories.

Price

Like tenderness, there were very few differences between segments of the Ohio beef supply chain regarding the ranked importance of the price of beef products. Price was ranked as the third most important attribute at 19.3%, 16.9%, and 17.9% of consumer, processor, and producer responses, respectively, and fell behind tenderness in all three supply chain groups.

Appearance/Color

In all three supply chain groups, appearance and color was not frequently mentioned as an important product attribute, ranking fourth at 9.5% of total consumer responses, sixth at 2.2% of total processor responses, and tying with appearance/color for the fifth rank at 1.6% of total producer responses.

Taste

Like freshness, consumer responses concerning taste were very different compared to processors and producers. Taste only composed 2.6% of total consumer responses, ranking it fifth.

Processors and producers mentioned taste far more frequently at 34.6% and 45.3% of responses, respectively, ranking it first as the most important beef attribute for these two supply chain segments.

Packaging

Out of all beef product attributes, packaging was one of the most consistently low-ranking responses across all Ohio supply chain groups. Packaging was mentioned as an important attribute in only 1.0% of consumer responses, ranking it sixth, and it only occurred slightly more frequently in processor and producer responses. Processors chose it as only 6.6% of their responses, ranking it fifth, and it only composed 1.8% of producer responses, ranking it fourth.

Discussion

Limitations

It is important to note that while there were very clear distinctions between the responses of Ohio beef consumers, processors, and producers at the time of these surveys, it is possible that the magnitude of these differences may not be the same of today's beef industry. Since 2001, when the beef consumer survey was administered, the downturn in the US economy and subsequent

record heights of beef prices (Waters and Hares, 2014) would most likely cause price to be of a more important rank to today's consumers than this data shows.

Furthermore, the results of the consumer survey may have decreased generalizability to Ohio beef consumers at large due to different sampling procedures utilized compared to the other two surveys. While all Ohio beef processors and producers were equally likely to be sampled for their respective surveys, the consumer survey was targeted at beef consumers having a minimum household income of \$75,000. Because this amount is significantly higher than that of the average consumer, it is possible that their priorities in purchasing beef products may not match the concerns of consumers from lower-income households.

Finally, it is possible that the survey formats themselves might have affected the results of this study. The beef consumer survey question utilized for this data set was a free response, open-ended question with no requirement for number of responses. Some respondents only listed one attribute to be important in their purchasing decisions, while others listed multiple attributes. In contrast, both the processor and producer surveys asked respondents to list their top three choices from an extensive, specific list of possible responses (Appendix I).

Despite these limitations, there is still an overwhelming difference between how Ohio beef producers and processors rank certain traits, such as freshness and taste, compared to Ohio beef consumers. Taking the above discrepancies into account, it is possible these differences may be less than this data suggests, but without more current, expansively sampled consumer data, it is difficult to predict the degree to which the differences in opinion may be affected.

Conclusions

As the above results show, producers, processors, and consumers were very closely aligned in their opinions with regard to tenderness and price being two of the top three important attributes to consider when purchasing beef products. In fact, all three groups of the supply chain were very similarly aligned as a whole on the importance of extrinsic product attributes (price and packaging), but less so regarding intrinsic product attributes (freshness, taste, tenderness, and appearance/color). The most drastic differences occurred between freshness and taste attributes. Both processors and producers underestimated the importance of freshness to Ohio beef consumers. Conversely, both processors and producers overestimated the importance of taste to Ohio beef consumers.

The cause of these vastly different rankings of freshness and taste, however, may have multiple sources. First, it is unclear what criteria the respondents to the consumer survey were using to establish freshness of beef products (extrinsic attributes such as sell-by date on packaging, intrinsic attributes such as overall color and appearance of product, etc.), and thus consumer measures of freshness may not be the same as those of processors or producers. This study was not designed to identify how consumers define and determine freshness of beef products, only whether or not it is important to their beef purchasing decisions.

For producers, the reasons for their underestimation of the importance of freshness to the consumer may go back to the original hypothesis. As previously established by Ottesen (2006) and Sepúlveda *et al* (2011), the ranking differences may be primarily attributed to the producer's location in the supply chain compared to the consumer. As producers are located farther from the end products of the supply chain, they may be less concerned with attributes that are only important in the retail case than the palatability attributes (flavor, juiciness, tenderness) their

production practices on the live animal (nutrition, handling, etc.) may directly influence. Thus, they may rank taste as a much more important attribute and give less emphasis to freshness.

For processors, however, this reasoning is insufficient. Despite being closer to the consumer in the supply chain, their responses reveal that they equally underestimated the importance of freshness and equally overestimated the importance of taste to the Ohio beef consumers.

Processors may be simply taking freshness for granted in their everyday business decisions; if beef products do not appear fresh in the retail case, they may be removing them to avoid negatively influencing consumers. It is also possible that processors are forgoing a focus on freshness for palatability attributes as several of the respondents in this survey sell their products through a smaller scale, full-service retail case, in which event the freshness of their product is of no concern. Their products would not change hands multiple times (from the packers, through warehouses and distribution centers, to retail outlets) as would occur in larger retail market chains. Therefore, their consumers may be providing them with more feedback or dialogue related to flavor differences than freshness differences as they compare it to the products they have purchased in larger retail outlets. Conversely, certain processors may only be dealing in frozen products, in which case freshness is not one of their considerations in their marketing decisions.

In addition, the past 30 years of the beef industry have been significantly influenced by the marketing programs of Certified Angus Beef (CAB) across all segments of the supply chain (Schroeder and Kovanda, 2003), which has placed an emphasis on consistent, exceptional flavor to attract consumers (Certified Angus Beef, LLC, 2014). As the leading breed influence in US beef cattle herds is currently Angus (Rutherford, 2014), it is possible that the popularity of CAB

marketing and its emphasis on flavor has influenced producers and processors to place a higher priority on taste attributes of their products, as reflected in the results.

Even with these multiple plausible reasons, there are clear differences between the combined responses of Ohio beef producers and processors versus those of consumers. Price and tenderness are all similarly ranked across all three categories, indicating that there is an understanding across all links of the supply chain that these two attributes continue to be very important in the production and marketing of beef products, but this same widespread understanding does not exist regarding taste and freshness. It is possible that the focus on taste from processors and producers has resulted in flavor-rich products that draw few concerns from consumers for this attribute, but freshness does not appear to have nearly the same focus.

Implications

Beef processors and producers in Ohio seem to recognize which attributes of beef products contribute to palatability and, thus, the importance of positive eating experiences to retain beef consumers. Those processors and producers pursuing niche and direct marketing programs need to maintain this focus on palatability attributes, but they may also need to consider increasing their awareness of visual aspects of beef products in the retail case. In turn, this may lead to increased consumer satisfaction, which will increase consumer likelihood of purchasing beef products. Increasing this emphasis on freshness for the consumer may ultimately improve the profitability and sustainability of Ohio beef producers and processors in niche and direct marketing programs, as well as help them capitalize on Ohio's unique infrastructure.

Bibliography

- Bernués, A., Olaizola, A., and Corcoran, K. (2003). Extrinsic attributes of red meat as indicators of quality in Europe: an application for market segmentation. *Food Quality and Preference*, 14, 265-276.
- Certified Angus Beef, LLC. (2014) About the Brand. Retrieved April 4, 2014, from <http://www.certifiedangusbeef.com/brand/>.
- Ottesen, G. (2006). Do upstream actors in the food chain know end-users' quality perceptions? Findings from the Norwegian salmon farming industry. *Supply Chain Management: An International Journal*, 11(5), 456–463.
- Resurreccion, A.V.A. (2003). Sensory aspects of consumer choices for meat and meat products. *Meat Science*, 66, 11-20.
- Rutherford, B. (2014, January 29) . U.S. Beef Herd Is Mostly Black But Changing Slightly. *BEEF Magazine*. Retrieved April 4, 2014, from <http://beefmagazine.com/cattle-genetics/us-beef-herd-mostly-black-changing-slightly?page=3>.
- Schroeder, T.C. and Kovanda, J. (2003) Beef alliances: motivations, extent, and future prospects. *Veterinary Clinics of North America: Food Animal Practice*, 19(2), 397-417.
- Sepúlveda, W.S., Maza, M.T., and Pardos, L. (2011). Aspects of quality related to the consumption and production of lamb meat. Consumers versus producers. *Meat Science*, 87, 366-372.
- U.S. Census Bureau. (2012). *Statistical Abstract of the United States*. Accessed Feb. 13, 2012. <http://www.census.gov/compendia/statab/2012/tables/12s0014.pdf>.
- USDA/Food Safety Inspection Service. (2010). Slaughter Establishment Availability—Updated 2010 Maps. Accessed Feb. 18, 2012. http://www.fsis.usda.gov/PDF/Slaughter_Estab_Maps_080910.pdf
- USDA/National Agricultural Statistics Service. (2009). *2007 Census of Agriculture*. Accessed Feb.17, 2012. http://www.agcensus.usda.gov/Publications/2007/Full_Report/usv1.pdf.
- USDA/National Agricultural Statistics Service. (2007). *2007 Census of Agriculture Farm Numbers*. Accessed Feb. 18, 2012. http://www.agcensus.usda.gov/Publications/2007/Online_Highlights/Fact_Sheets/Farm_Numbers/farm_numbers.pdf
- USDA/National Agricultural Statistics Service. (2011). *Livestock Slaughter 2010 Summary*. Accessed Feb. 13, 2012. <http://usda.mannlib.cornell.edu/usda/current/LiveSlauSu/LiveSlauSu-04-25-2011.pdf>

- Umberger, W.J., Boxall, P.C., and Lacy, R.C. (2009). Role of credence and health information in determining US consumers' willingness-to-pay for grass-finished beef. *The Australian Journal of Agricultural and Resource Economics*, 53, 603-62.
- Waters, T. and Hares, S. (2014, March 12). CME live cattle rise with record-high beef prices. Reuters. Retrieved April 10, 2014 from <http://www.reuters.com/article/2014/03/12/markets-livestock-cme-idUSL2N0M90ZB20140312>

Appendix I

Consumer

2001 Ohio Department of Agriculture Ohio Born and Raised Beef Survey

Question: "Thinking just of your beef cut purchases now, what are the qualities you look for in your beef cut purchases?"

Processor

2012 Ohio State University Processor Survey Assessing Production, Economics and Marketing of Meat from Forage-Based Systems

Question: "Of the traits mentioned in Question 10, list the top 3 in order of the highest priority for repeat purchase of meat based animal products that you provide your clients."

- flavor of meat
- tenderness of meat
- juiciness of meat
- fat color
- lean color
- amount of marbling
- packaging
- nutritional labeling
- price
- fresh product
- frozen product
- pre-cooked (convenience)
- desire for organic
- animal welfare
- knowledge of the actual producer
- produced without additional hormones
- produced without antibiotics

Producer

2011 Ohio State University Producer Survey Assessing Production, Economics and Marketing for Forage-Based Systems

Question: "Of the traits mentioned in Questions 9 & 10, list the top 3 in order of the highest priority for repeat purchase of meat based animal products you sell."

- meat flavor intensity
- off flavor of meat
- cooked aroma of meat
- types of meat cuts
- meat tenderness
- meat juiciness
- fat color in the retail case
- lean color in the retail case
- meat shelf-life

- packaging design
- packaging type
- labeling
- price
- frozen meat precuts
- fresh/refrigerated meat products